Claims:

1. An apparatus for reducing pressure in a carrier line such as natural gas pipelines and capturing the resultant waste energy and coolant through the production of a processed gas, said apparatus comprising:

a flow converter for gaseous communication with a carrier line, wherein a first end of said flow converter accepts high pressure pipeline gas in a primary stream, there is a pressure drop through the flow converter and then a lower pressure pipeline gas is released from a second end of said flow converter to a carrier line;

a water extractor in communication with said carrier line;

an electricity generator mechanically linked to said flow converter for transforming at least a portion of the excess energy resulting from the pressure drop into electrical energy; and

a processed gas generator electrically linked to said electricity generator for the production of a processed gas, such that in use, at least a portion of the energy released from the pressure drop is captured and utilized for the production of a processed gas.

2. The apparatus of claim 1, further comprising at least one heat source proximate to said flow converter to heat said carrier line.

3. The apparatus of claim 2 wherein said heat source is upstream of said flow converter.

4. The apparatus of claim 2 wherein said heat source is downstream of said flow converter.

5. The apparatus of claim 2, wherein said processed gas generator is an electrolyser electrically linked to said electricity generator for the production of a processed gas.

6. The apparatus of claim 5 further comprising a collection chamber in gaseous communication with said processed gas generator for collecting said processed gas.

7. The apparatus of claim 6, further comprising a gas line in gaseous communication with said processed gas generator for transporting said processed gas.

8. The apparatus of claim 7 further comprising compressor means, said compressor means for operable connection to said collection chamber and electrically connectable with said electricity generator.

9. The apparatus of claim 8, wherein said compressor means is a mechanical compressor.

10. The apparatus of claim 9, further comprising at least one heat exchanger in communication with said collection chamber for accepting said cooling stream and cooling said collection chamber.

11. The apparatus of claim 10 wherein there are two heat exchangers.

12. The apparatus of claim 10 wherein said electrolyser is a water electrolyser.

13. The apparatus of claim 12 wherein said compressor comprises a hydrogen receiver and hydride reservoirs.

14. The apparatus of claim 10, wherein said electricity generator is in electrical communication with a power grid such that in use, excess energy can be sent to said power grid.

15. The apparatus of claim 10 wherein a secondary electrical device is in electrical communication with said electricity generator.

16. The apparatus of claim 10 wherein said water extractor comprises an absorbent selected from the group consisting of triethylene glycol, diethylene glycol, ethylene glycol and methanol.

17. The apparatus of claim 16, wherein said water extractor comprises a methanol injection and recovery loop operably linked with said carrier line, such that in use, methanol is injected into said primary stream.

18. The apparatus of claim 17, wherein said methanol injection and recovery loop comprises a methanol tank operably linked with an injection pump, said injection pump in fluid communication with said carrier line for injecting methanol into a primary stream, a methanol separation tank, said methanol separation tank in fluid communication with said carrier line downstream of said injection pump, for recovering methanol and in fluid communication with said methanol tank.

19. The apparatus of claim 10, wherein said water extractor is an adsorbent selected from the group consisting of alumina, silica gel and molecular sieves.

20. The apparatus of claim 10, wherein said water extractor is an expansion refrigerator.

21. The apparatus of claim 10 wherein said water extractor is an injector of hydrate point depressants.

22. The apparatus of any one of claims 1-21 wherein said flow converter is a turbo-expander.

23. The apparatus of any one of claims 1-21 wherein said flow converter is an expansion engine.

24. A method of reducing pressure in a carrier line such as a natural gas pipeline and capturing at least a portion of the resultant waste energy, said method comprising expanding a pipeline gas in a carrier line, transforming the resultant mechanical energy to

electrical energy, utilizing said electrical energy to generate a processed gas and collecting said processed gas.

25. The method of claim 24 further comprising heating said pipeline gas.

26. The method of claim 25 further comprising cooling said processed gas.

27. The method of claim 26 wherein said processed gas is cooled by a cooling stream.

28. The method of claim 27 further comprising compressing said processed gas.

29. The method of claim 28 wherein said gas is hydrogen gas.

30. The method of claim 29 wherein said hydrogen gas is generated by electrolysis.

31. The method of claim 29 wherein said hydrogen gas is produced by pyrolysis.

32. The method of claim 29 wherein said hydrogen gas is produced by thermo chemical means.

33. The method of any one of claims 24 to 32, wherein surplus power is released to a power grid.

34. A method for preparing and dispensing hydrogen for hydrogen fueled vehicles by reducing pressure in a carrier line such as a natural gas pipeline and capturing resultant waste energy, said method comprising expanding a pipeline gas in a carrier line, transforming the resultant mechanical energy to electrical energy, utilizing said electrical energy to generate hydrogen gas, collecting said hydrogen gas, compressing said hydrogen gas and dispensing said hydrogen gas.

35. The method of claim 34 further comprising heating said pipeline gas.

36. An installation for fueling hydrogen fueled vehicles by reducing pressure in a carrier line such as a natural gas pipeline and capturing at least a portion of the resultant waste energy, said installation comprising:

a flow converter for gaseous communication with a carrier line, wherein a first end of said flow converter accepts high pressure pipeline gas in a primary stream, there is a pressure drop through the flow converter and then a lower pressure pipeline gas is released from a second end of said flow converter to a carrier line as a cooling stream;

an electricity generator mechanically linked to said flow converter for transforming the excess energy resulting from the pressure drop into electrical energy;

a hydrogen gas generator electrically linked to said electrical generator for the production of hydrogen gas;

a chamber in communication with said hydrogen gas generator for collecting hydrogen gas; and

a hydrogen gas dispenser.

37. The installation of claim 36 wherein said hydrogen generator is an electrolyser.

38. A system for production of a processed gas, comprising:

an electricity generator configured to produce electrical power based on a pressure drop in a gas flow; and

a processed gas generator electrically linked to the electrical generator for the production of the processed gas.

39. A system for production of a processed gas, comprising:

a flow converter configured to receive a pipeline gas flow at a first pressure and deliver the pipeline gas flow at a second pressure, wherein the first pressure is greater than the second pressure;

an electricity generator in communication with the flow converter and configured to produce electrical power based on conversion of the pipeline gas flow from the first pressure to the second pressure;

a water extractor in communication with said carrier line; and

a processed gas generator electrically linked to the electricity generator configured to produce the processed gas.

40. The system of claim 39, wherein the processed gas is hydrogen gas.

41. The system of claim 39, wherein the flow converter is configured to cool the processed gas based on the pipeline gas flow at the second pressure.

42. The system of claim 39, wherein said processed gas generator is an electrolyser.

43. The system of claim 39, further comprising a gas line in gaseous communication with said processed gas generator for transporting a gas.

44. The system of claim 43, further comprising a collection chamber in gaseous communication with said processed gas generator.

45. The system of claim 44 further comprising compressor means, said compressor means for operable connection to said collection chamber and electrically connectable with said electricity generator.

46. The system of claim 45, wherein said compressor means is a mechanical compressor.

47. The system of claim 45 wherein said compressor means comprises a hydrogen receiver and hydride reservoirs.

48. The system of claim 45, further comprising at least one heat exchanger in communication with said collection chamber for accepting said cooling stream and cooling said collection chamber.

49. The system of claim 48 wherein there are two heat exchangers.

50. The system of claim 50, further comprising an electrical link to a power grid such that in use excess energy can be sent to a power grid.

51. The system of claim 39 wherein said water extractor comprises an absorbent selected from the group consisting of triethylene glycol, diethylene glycol, ethylene glycol and methanol.

52. The system of claim 39, wherein said water extractor comprises a methanol injection and recovery loop operably linked with said carrier line, such that in use, methanol is injected into said primary stream.

53. The system of claim 52, wherein said methanol injection and recovery loop comprises a methanol tank operably linked with an injection pump, said injection pump in fluid communication with said carrier line for injecting methanol into a primary stream, a methanol separation tank, said methanol separation tank in fluid communication with said carrier line downstream of said injection pump, for recovering methanol and in fluid communication with said methanol tank.

54. The system of claim 39, wherein said water extractor is an adsorbent selected from the group consisting of alumina, silica gel and molecular sieves.

55. The system of claim 39, wherein said water extractor is an expansion refrigerator.

56. The system of claim 39 wherein said water extractor is an injector of hydrate point depressants.

57. The system of any one of claims 39-57 wherein said flow converter is a turbo-expander.

58. The system of any one of claims 39-57 wherein said flow converter is an expansion engine.